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EXAMINER	
SHARON, AYAL I	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/080,742	Applicant(s) OLHOFER ET AL.	
	Examiner Ayal I. Sharon	Art Unit 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 February 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/19/05*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. Claims 1-20 of U.S. Application 10/080,742 are currently pending.
2. The application was originally filed on 02/21/2002.
3. The application claims priority to European Patent Application No. 01 104 723.0 filed on Feb. 26, 2001.

Drawings

4. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. **Claims 1-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.**
7. The claims, as written, are directed to an abstract mathematical algorithm. The claimed invention is therefore not concrete or tangible. See MPEP §2106 (A),

and *In re Warmerdam*, 33 F.3d 1354, 1360, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994). See also *Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459.

8. The claims also lack a practical application – a "**useful, concrete and tangible result.**" The test for practical application as applied by the examiner involves the determination of the following factors:
    a. "**Useful**" - The Supreme Court in *Diamond v. Diehr* requires that the examiner look at the claimed invention as a whole and compare any asserted utility with the claimed invention to determine whether the asserted utility is accomplished. Applying utility case law the examiner will note that:
        I. the utility need not be expressly recited in the claims, rather it may be inferred.
        II. if the utility is not asserted in the written description, then it must be well established.
    b. "**Tangible**" - Applying *In re Warmerdam*, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994), the examiner will determine whether there is simply a mathematical construct claimed, such as a disembodied data structure and method of making it. If so, the claim involves no more than a manipulation of an abstract idea and therefore, is nonstatutory under 35 U.S.C. § 101. In *Warmerdam* the abstract idea of a data structure became capable of producing a useful result when it was fixed in a

tangible medium which enabled its functionality to be realized. See MPEP §2106 (A). See also *Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459.

c. "**Concrete**" - Another consideration is whether the invention produces a "concrete" result. Usually, this question arises when a result cannot be assured. An appropriate rejection under 35 U.S.C. § 101 should be accompanied by a lack of enablement rejection, because the invention cannot operate as intended without undue experimentation.

9. The Examiner respectfully submits that under current PTO practice, the claimed invention does not recite *either a tangible or a concrete result.*

   a. The claims are not tangible because simply a mathematical construct is claimed.

   b. The claims are not concrete because there is no identifiable output. Since there are no results, results are not assured.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. The prior art used for these rejections is as follows:

- Bäck, T. et al. "Evolutionary Computation: Comments on the History and Current State." IEEE Transactions on Evolutionary Computation, April 1997. Vol.1, No.1, pp.3-17. (Hereinafter "**Bäck**").

12. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

13. Claims 1-13 and 15-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Back.

14. In regards to Claim 1, Bäck teaches the following limitations:

> 1. A computer based method of optimizing one of a model, structure, shape and design representing a physical objectbased on an evolution strategy, comprising:

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> describing one of the model, structure, shape and design representing the physical object to be optimized using a parameter set comprising object parameters;

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> creating offsprings of the parameter set by modifying the object parameters, wherein said modifying includes at least one of mutating the object parameters and recombining the object parameters;

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> evaluating quality of the offsprings;

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> wherein the parameter set comprises at least one strategy parameter representing a step-size of the mutation of associated object parameters; and

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"In evolution strategies, the individuals consist of object variables ... and so-called *strategy parameters*, which are discussed in the next section."]

> adapting a number of the object parameters and a number of associated strategy parameters during optimization.

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"In [125] Schwefel introduced an endogenous mechanism for step-size control by incorporating these parameters into the representation in order to facilitate the evolutionary *self-adaptation* of these parameters by applying evolutionary operators to the object variables and the strategy parameters for mutation at the same time ...]

15. In regards to Claim 2, Bäck teaches the following limitations:

> 2. The optimization method of claim 1 further comprising altering the object parameters and the strategy parameters, wherein said altering includes at least one of selectively inserting and removing an object parameter and a strategy parameter.

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"In evolution strategies, the individuals consist of object variables ... and so-called *strategy parameters*, which are discussed in the next section."]

16. In regards to Claim 3, Bäck teaches the following limitations:

> 3. The optimization method of claim 2, further comprising estimating a value of a newly inserted strategy parameter based on information of strategy parameters associated with correlated object parameters.

[See Bäck, especially: p.7, right column, 2nd para., which teaches that:

"A more elaborate *correlated mutation* scheme allows for the rotation of hyper-ellipses, as shown in the right part of Fig.2. This mechanism aims at a better adaptation to the topology of the objective function ..."]

17. In regards to Claim 4, Bäck teaches the following limitations:

> 4. The optimization method of claim 1, further comprising estimating a value of a newly inserted strategy parameter based on information of strategy parameters associated with correlated object parameters.

[See Bäck, especially: p.7, right column, 2nd para., which teaches that:

"A more elaborate *correlated mutation* scheme allows for the rotation of hyper-ellipses, as shown in the right part of Fig.2. This mechanism aims at a better adaptation to the topology of the objective function ..."]

18. In regards to Claim 5, Bäck teaches the following limitations:

> 5. The optimization method of claim 1, further comprising determining a position of altering an object parameter and an associated strategy parameter using a random function.

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"The mutation operator works by adding a normally distributed random vector $\check{z}$ ...(i.e. the components of $\check{z}$ are normally distributed with expectation zero and variance σ_i^2)."]

19. In regards to Claim 6, Bäck teaches the following limitations:

> 6. The optimization method of claim 5, further comprising determining a time of altering an object parameter and the associated strategy parameter using a random function.

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"The mutation operator works by adding a normally distributed random vector $\check{z}$ ...(i.e. the components of $\check{z}$ are normally distributed with expectation zero and variance σ_i^2)."]

20. In regards to Claim 7, Bäck teaches the following limitations:

> 7. The optimization method of claim 1, further comprising determining a time of altering of an object parameter and an associated strategy parameter using a random function.

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"The mutation operator works by adding a normally distributed random vector $\check{z}$ ...(i.e. the components of $\check{z}$ are normally distributed with expectation zero and variance σ_i^2)."]

21. In regards to Claim 8, Bäck teaches the following limitations:

> 8. The optimization method of claim 1, further comprising determining a position of altering of an object parameter and an associated strategy parameter by progress of the evolutionary optimization.

[See Bäck, especially: pp.7-8, Section "C. Self-Adaptation"]

22. In regards to Claim 9, Bäck teaches the following limitations:

> 9. The optimization method of claim 8, further comprising determining a time of altering of an object parameter and the associated strategy parameter by the progress of the evolutionary optimization.

[See Bäck, especially: pp.7-8, Section "C. Self-Adaptation"]

23. In regards to Claim 10, Bäck teaches the following limitations:

> 10. The optimization method of claim 8, further comprising determining a time of altering of an object parameter and the associated strategy parameter by the progress of the evolutionary optimization.

[See Bäck, especially: pp.7-8, Section "C. Self-Adaptation"]

24. In regards to Claim 11, Bäck teaches the following limitations:

> 11. The optimization method of claim 1, wherein the mutating of the object parameters does not directly influence the result of the evaluating step.

[See Bäck, especially: pp.7-8, Section "C. Self-Adaptation"]

25. In regards to Claim 12, Bäck teaches the following limitations:

> 12. A computer based method based of optimizing one of a model, structure, shape and design representing a physical object based on an evolution strategy, comprising:

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> describing one of the model, structure, shape and design representing the physical object to be optimized using a parameter set comprising object parameters;

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> creating offsprings of the parameter set by mutating of the object parameters and a structure of the parameter set, the structure of a parameter set defined by a number and position of the object parameters and strategy parameters; and

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> evaluating quality of the offsprings;

[See Bäck, especially: pp.4-5, Section "III. The Structure of An Evolutionary Algorithm"]

> wherein the parameter set comprises at least one strategy parameter representing a step-size of the mutation of associated object parameters.

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"In evolution strategies, the individuals consist of object variables ... and so-called *strategy parameters*, which are discussed in the next section."]

Bäck also teaches:

"In [125] Schwefel introduced an endogenous mechanism for step-size control by incorporating these parameters into the representation in order to facilitate the evolutionary *self-adaptation* of these parameters by applying evolutionary operators to the object variables and the strategy parameters for mutation at the same time ...]

26. In regards to Claim 13, Bäck teaches the following limitations:

> 13. The optimization method of claim 12, wherein said step-size of the mutation is a variance of a normal distribution.

[See Bäck, especially: p.7, Section "C. Self-Adaptation", which teaches that Equations (7) and (8) provide weighted averages for the mean and standard deviation of the effects of mutation.]

27. In regards to Claim 15, Bäck teaches the following limitations:

> 15. The optimization method of claim 14, wherein the object parameters comprise control points and knot points, the method further comprising adapting a knot vector by inserting new control points and strategy parameters.

[See Bäck, especially: p.7, Section "C. Self-Adaptation", which teaches that:

"This mutation scheme, which is most frequently used in evolution strategies, is schematically depicted (for *n*=2) in the middle of Fig.2. The locations of equal probability density for descendants are concentric hyper-ellipses (just one is depicted in Fig.2) around the parental midpoint."]

Examiner interprets that the claimed "knot vector" correspond to Bäck's "concentric hyper-ellipses."

28. In regards to Claim 16, Bäck teaches the following limitations:

> 16. The optimization method of claim 15, further comprising estimating values of newly inserted strategy parameters based upon values of strategy parameters of neighboring control points.

[See Bäck, especially: p.7, Section "C. Self-Adaptation", which teaches that:

"This mutation scheme, which is most frequently used in evolution strategies, is schematically depicted (for *n*=2) in the middle of Fig.2. The locations of equal probability density for descendants are concentric hyper-ellipses (just one is depicted in Fig.2) around the parental midpoint."]

29. In regards to Claim 17, Bäck teaches the following limitations:

> 17. A computer based method for optimizing a spline coded structure based on an evolution strategy, comprising:
>
> describing the spline coded structure to be optimized using a parameter set comprising object parameters representing control points and knot points and at least one strategy parameter representing a step-size of a mutation of associated object parameters;

[See Bäck, especially: p.7, left column, 2nd para., which teaches that:

"In evolution strategies, the individuals consist of object variables ... and so-called *strategy parameters*, which are discussed in the next section."]

Bäck also teaches:

"In [125] Schwefel introduced an endogenous mechanism for step-size control by incorporating these parameters into the representation in order to facilitate the evolutionary *self-adaptation* of these parameters by applying evolutionary operators to the object variables and the strategy parameters for mutation at the same time ...]

> mutating the object parameters and the strategy parameters to create offsprings of the set, comprising:
>
> determining a control point insertion,
> inserting the control point in the parameter set,
> inserting a strategy parameter for the inserted control point,
> determining the knot points modified by the insertion of the control point,

[See Bäck, especially: p.7, Section "C. Self-Adaptation", which teaches that:

"This mutation scheme, which is most frequently used in evolution strategies, is schematically depicted (for *n*=2) in the middle of Fig.2. The locations of equal probability density for descendants are concentric hyper-ellipses (just one is depicted in Fig.2) around the parental midpoint."]

Examiner interprets that the claimed "knot points" correspond to Bäck's "concentric hyper-ellipses."

determining a weighted averaging of strategy parameter values of modified control points, and

assigning the weighted average value as a value of the inserted strategy parameter; and

evaluating quality of the offsprings.

[See Bäck, especially: p.7, Section "C. Self-Adaptation", which teaches that Equations (7) and (8) provide weighted averages for the mean and standard deviation of the effects of mutation.]

30. In regards to Claim 18, Bäck teaches the following limitations:

18. The method of claim 17, wherein said step-size of the mutation is a variance of anormal distribution.

[See Bäck, especially: p.7, Section "C. Self-Adaptation", which teaches that Equations (7) and (8) provide weighted averages for the mean and standard deviation of the effects of mutation.]

Claim Rejections - 35 USC § 103

31. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

32. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35

U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

33. The prior art used for these rejections is as follows:

   a. Bäck, T. et al. "Evolutionary Computation: Comments on the History and Current State." IEEE Transactions on Evolutionary Computation, April 1997. Vol.1, No.1, pp.3-17. (Hereinafter "**Bäck**").

   b. Weinert, K. et al. "Discrete NURBS-Surface Approximation Using an Evolutionary Strategy." REIHE CI 87/00, SFB 531, 2000. pp.1-7. (Cited by Applicant. Hereinafter "**Weinert**").

34. The claim rejections are hereby summarized for Applicant's convenience. The detailed rejections follow.

35. **Claims 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bäck in view of Weinert.**

36. Bäck teaches most of the instant invention, as applied in the rejections of independent claims 12 and 17. However, Bäck does not expressly teach the limitations claimed in dependent claims 14 and 19.

37. In regards to Claim 14, Bäck does not expressly teach the following limitations:

> 14. The optimization method of claim 12, wherein said one of the model, structure, shape, and design is described using a spline.

Weinert, on the other hand, teaches the use of evolution strategy for spline curve optimization (See "Introduction"). Weinert also teaches (See "Conclusions and Outlook" section) that "Quality demands in CAD, e.g. the design of turbine

blades, can be very high ... NURBS are an efficient and intuitive way to represent smooth surfaces using only few control points."

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Bäck with those of Weinert, because Weinert teaches that using evolution strategy for spline curve optimization is "... an efficient and intuitive way to represent smooth surfaces using only few control points." (See Weinert, "Conclusions and Outlook" section on the next-to-last page).

38. In regards to Claim 19, Bäck does not expressly teach the following limitations:

> 19. The method of claim 1, <u>wherein the model, structure, shape and design representing the physical object comprises one of:</u>
>
> <u>an airfoil;</u>
> <u>a spline coded structure;</u>
> <u>a turbine blade for a gas turbine;</u>
> <u>an aerodynamic structure; and</u>
> <u>a hydrodynamic structure</u>.

Weinert, on the other hand, teaches the use of evolution strategy for spline curve optimization (See "Introduction"). Weinert also teaches (See "Conclusions and Outlook" section) that "Quality demands in CAD, e.g. the design of turbine blades, can be very high ... NURBS are an efficient and intuitive way to represent smooth surfaces using only few control points."

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Bäck with those of Weinert, because Weinert teaches that using evolution strategy for spline curve optimization is "... an efficient and intuitive way to represent smooth surfaces

using only few control points." (See Weinert, "Conclusions and Outlook" section on the next-to-last page).

39. **Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bäck in view of Official Notice.**

40. Bäck teaches most of the instant invention, as applied in the rejection of independent claim 17. However, Bäck does not expressly teach the limitations claimed in dependent claim 20.

41. In regards to Claim 20, Bäck does not expressly teach the following limitations:

> 20. A computer program stored in a computer readable medium for performing the method of claim 17.

Official Notice is given that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Bäck by placing the algorithm on a computer readable medium, because doing so would enable running the algorithm on a computer.

Response to Amendment

<u>*Specification*</u>

42. The amendments to the specification do not add new matter. Examiner accepts these amendments to the specification.

Claim Rejections - 35 USC § 101

43. In regards to the 35 USC § 101 rejections of claims 1-20, Applicants' arguments are unpersuasive. In particular, Examiner finds that claims 1-20 do not recite a concrete, useful, tangible result.

44. One may not patent every "substantial practical application" of an idea, law of nature or natural phenomena because such a patent "in practical effect be a patent on the [idea, law of nature or natural phenomena] itself." Gottschalk v. Benson, 409 U.S. 63, 71-72, 175 USPQ 673, 676 (1972). This issue is also addressed in pp.14 and 23 of the "Patentability Guidelines". (The applicants referred to the "Patentability Guidelines" in p.12 of their amendment dated 4/25/2006).

45. The purpose of the "concrete, useful, tangible result" test is to prevent the issuing of patents on every "substantial practical application" of an idea, law of nature or natural phenomena. See In re Alappat, 33 F.3d 1526, 31 USPQ2d 1545. See also State Street Bank & Trust Co. v. Signature Financial Group Inc., 149 F. 3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998) and AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 50 USPQ2d 1447 (Fed. Cir. 1999).

46. See In re Alappat, 33 F.3d at 1544. ("Indeed, claim 15 as written is not 'so abstract and sweeping' that it would 'wholly pre-empt' the use of any apparatus employing the combination of mathematical calculations recited therein. See Benson, 409 U.S. at 68-72 (1972). Rather, claim 15 is limited to the use of a particularly claimed combination of elements performing the particularly claimed

combination of calculations to transform, i.e., rasterize, digitized waveforms (data) into anti-aliased, pixel illumination data to produce a smooth waveform").

47. See State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02. ("[T]he transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces 'a useful, concrete and tangible result' – a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades").

48. See also AT&T, 172 F.3d at 1358, 50 USPQ2d at 1452 (Claims drawn to a long-distance telephone billing process containing mathematical algorithms were held patentable subject matter because the process used the algorithm to produce a useful, concrete, tangible result - a primary inter-exchange carrier ("PIC") indicator - without preempting other uses of the mathematical principle).

49. In regards to claims 1-18 and 20 of the instant application, however, Examiner finds that the Applicants' claims are 'so abstract and sweeping' that they would 'wholly pre-empt' the use of any apparatus employing the combination of mathematical calculations recited therein.

50. The Applicants argue (see p.14 of the amendment dated 4/25/2006) that the claims "provide a useful, concrete and tangible result because they are directed to optimizing a model, structure, shape or design representing a physical object such as a spline coded structure."

51. Examiner finds that "a model, structure, shape or design representing a physical object" (with or without the pseudo-limitation of "such as a spline coded structure") corresponds to the Alappat definition of a claim that is "'so abstract and sweeping' that it would 'wholly pre-empt' the use of any apparatus employing the combination of mathematical calculations recited therein."
52. In regards to claim 19, Examiner finds that the limitations of "an airfoil" and "a turbine blade for a gas turbine" are concrete, useful, tangible results, and also specific "substantial practical applications". The remaining limitiations ("a spline coded structure", "an aerodynamic structure", and "a hydrodynamic structure"), however, are not.
53. Examiner is therefore maintaining the rejections of all the claims.

Claim Rejections - 35 USC § 102

54. The Applicants unpersuasively argue that the Bäck reference "fails to disclose or suggest adapting the number and/or position of object parameters and associated strategy parameters, mutating the structure of the parameter set, or inserting a control point and an associated strategy parameter in the parameter set, as recited in independent claims 1, 12, and 17 (See p.17 of the amendment filed on 4/25/2006).
55. The Applicants also unpersuasively argue that "the object variables and strategy parameters are actually taken as constant in Bäck" (See p.17 of the amendment filed on 4/25/2006).

56. Examiner respectfully disagrees. Bäck teaches the following in "Section C: Self Adaptation" on p.7:

> C. *Self-Adaptation*
>
> In [125] Schwefel introduced an endogenous mechanism for step-size control by incorporating these parameters into the representation in order to facilitate the evolutionary self-adaptation of these parameters by applying evolutionary operators to the object variables and the strategy parameters for mutation at the same time, i.e., searching the space of solutions and strategy parameters simultaneously. This way, a suitable adjustment and diversity of mutation parameters should be provided under arbitrary circumstances.
>
> More formally, an individual $\mathbf{a} = (\mathbf{x}, \boldsymbol{\sigma})$ consists of object variables $\boldsymbol{x} \in \mathbb{R}^n$ and strategy parameters $\boldsymbol{\sigma} \in \mathbb{R}^n_+$. The mutation operator works by adding a normally distributed random vector $\boldsymbol{z} \in \mathbb{R}^n$ with $\boldsymbol{z}_i$ $\mathbf{N}(0, \sigma_i^2)$ (i.e., the components of z are normally distributed with expectation zero and variance σ_i^2).

In addition, Equations (7) and (8), which immediately follow the cited paragraph, further teach mathematical operations that correspond to the claimed "adapting the position of object parameters and strategy parameters." Equations (7) and (8) refute Applicants' argument that "the object variables and strategy parameters are actually taken as constant in Bäck."

57. Furthermore, the subsequent paragraph in Bäck teaches:

> This mutation scheme, which is most frequently used in evolution strategies, is schematically depicted (for n = 2) in the middle of Fig. 2. The locations of equal probability density for descendants are concentric hyperellipses (just one is depicted in Fig. 2) around the parental midpoint. In the case considered here, i.e., up to *n* variances, but no covariances, the axes of the hyperellipses are congruent with the coordinate axes.

Examiner interprets the reference to a "mutation scheme" as corresponding to the claimed "mutating the structure of the parameter set." In addition, Examiner

interprets that Bäck's "parental midpoint" corresponds to the claimed "control point".

58. Finally, the subsequent paragraph in Bäck teaches:

> Two modifications of this scheme have to be mentioned: a simplified version uses just one step-size parameter for all of the object variables. In this case the hyperellipses are reduced to hyperspheres, as depicted in the left part of Fig. 2. A more elaborate correlated mutation scheme allows for the rotation of hyperellipses, as shown in the right part of Fig. 2. This mechanism aims at a better adaptation to the topology of the objective function (for details, see [79]).

Examiner interprets that the "rotation of the hyperellipses, as shown in the right part of Fig. 2" is further evidence that Bäck's "parental midpoint" corresponds to the claimed "control point".

59. The Examiner is therefore maintaining the 35 USC § 102 rejections.

Claim Rejections - 35 USC § 103

60. The rejections of claims 14, 19, and 20 are maintained for the same reasons that the rejections of claim 1 have been maintained.

Conclusion

61. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory

period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ayal I. Sharon whose telephone number is (571) 272-3714. The examiner can normally be reached on Monday through Thursday, and the first Friday of a bi-week, 8:30 am – 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached at (571) 272-3753.

Any response to this office action should be faxed to (571) 273-8300, or mailed to:

USPTO
P.O. Box 1450
Alexandria, VA 22313-1450

or hand carried to:

USPTO
Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Tech Center 2100 Receptionist, whose telephone number is (571) 272-2100.

Ayal I. Sharon
Art Unit 2123
July 13, 2006

PAUL RODRIGUEZ
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

7/19/06